

# **Updates on Photochemical Modeling for the Early Action Compact**

## **San Antonio Region**

**Photochemical Modeling Summit  
January 21<sup>st</sup>, 2004**

**Presented by Steven Smeltzer  
of  
Alamo Area Council of Governments**

# Outline

- Computer System
- Emission Inventory Updates in the Photochemical Model Environment
- Meteorology and Input Parameters
- CAMx Performance Evaluation
- Future Design Value
- Emission Matrix Analysis and 20-ton-reduction Runs
- Pollution Transport
- Control Strategy Development

# Computer System

- Red Hat Linux 9.0
- Pacific Group Fortran Compiler
- 1 gigabyte of DDR Ram
- Dual XEON 3.06 GHz processors
- Dual 17" flat screen monitors
- 4 - 200gb IDE Hard Drives
- 1 - 80gb SCSI Hard Drive
- CAMx version 3.10b
  
- 5.75 hours per model run (O3 output only)

# Emission Inventory Updates in the Photochemical Model Environment

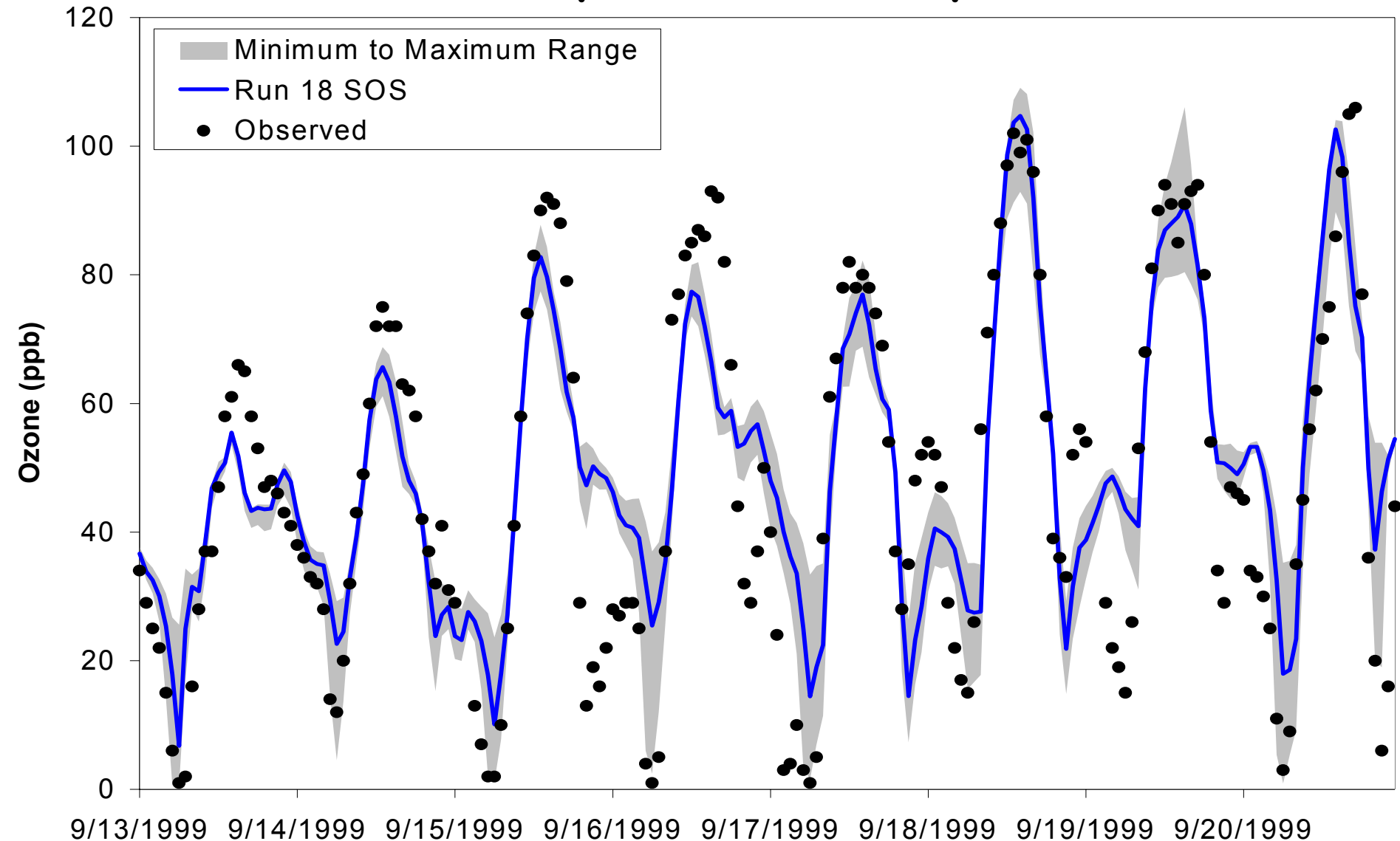
- Latest version of Emission Inventory data (Mobile 6) for counties of Bexar, Hays, Travis, and Williamson were used
- Emission inventory (Mobile5) for counties of Bastrop, Caldwell, Comal, Guadalupe, and Wilson was adjusted with Mobile6 factors
- Emission Inventory for areas outside of Texas was updated with the latest 2007 regional EI
- Updated wastewater estimates in Bexar County
- Inclusion of impacts of control strategies implemented for 2007 Houston SIP (does not include TERP)



# Meteorology and Input Parameters

- Updated model with moderate drought stress conditions that represented Sept. 13-20<sup>th</sup>, 1999 conditions
- Met Run 5g (latest meteorology run)
- SOS boundary conditions (developed by ENVIRON and similar conditions were used in the Aug. 13-22, 1999 modeling episode in the DFW area for the SIP)
- 2007 projected meteorology inputs are the same as 1999 base case

# Predicted vs Observed Hourly Ozone Values at CAMS 23 for the September 1999 Episode

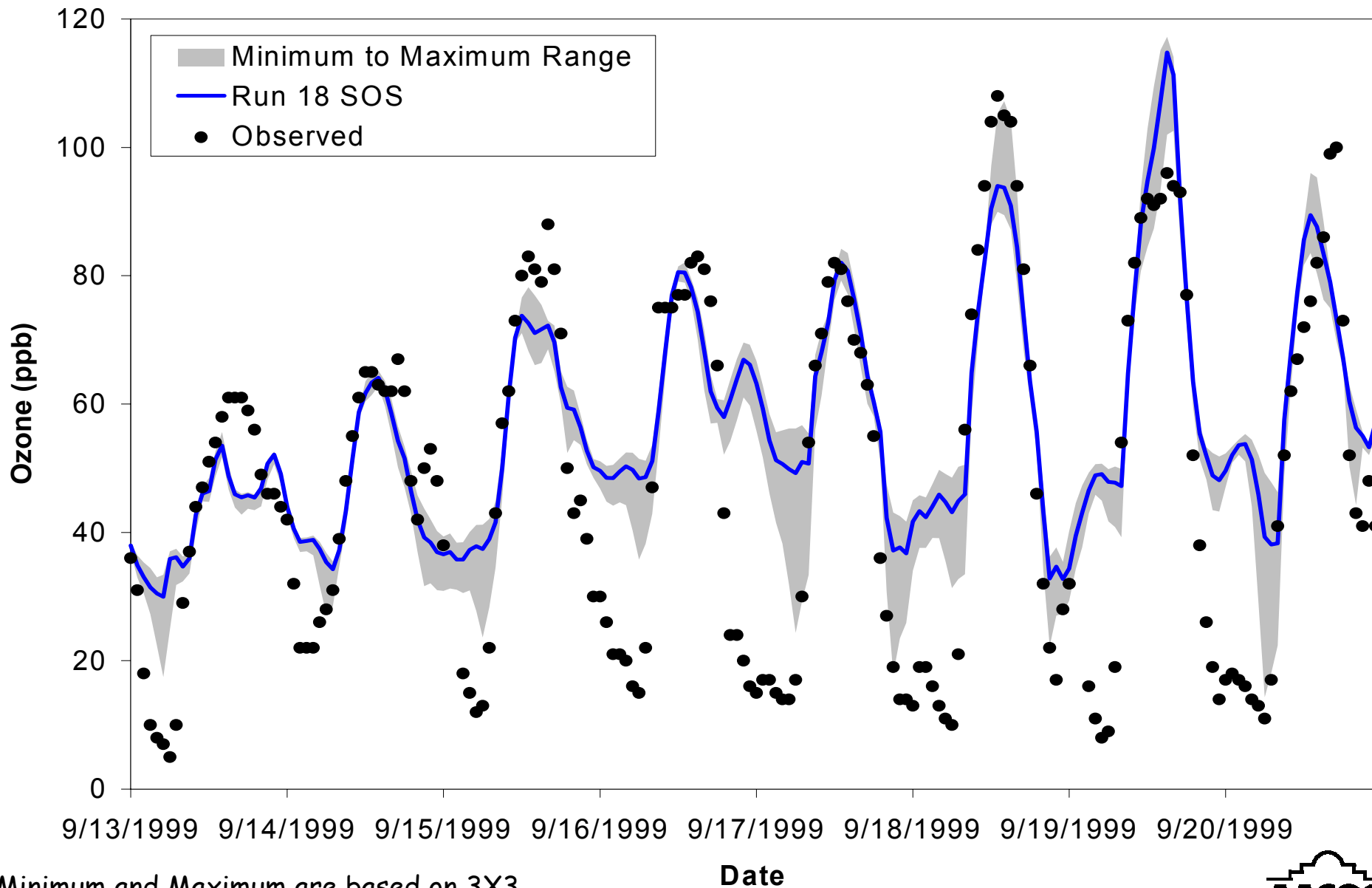


Minimum and Maximum are based on 3X3 grid cells around the CAMS station

Date

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# Predicted vs Observed Hourly Ozone Values at CAMS 58 for the September 1999 Episode



Minimum and Maximum are based on 3X3 grid cells around the CAMS station

**8-hour statistical metrics, based on the predicted daily maximum ozone concentration within a 7x7 array of grid cells near each monitor.**

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<b>Date</b>	<b>Maximum Observed 8-Hour Ozone Concentration (ppb)</b>	<b>Maximum Predicted 8-Hour Ozone Concentration (ppb)</b>	<b>Normalized Bias</b>	<b>Fractional Bias</b>	<b>Normalized Error</b>	<b>Fractional Error</b>
09/15/99	75.6	74.7	-0.6%	-1.0%	7.1%	7.2%
09/16/99	76.5	75.6	-0.4%	-0.8%	8.3%	8.3%
09/17/99	84.6	82.0	-2.4%	-2.7%	7.5%	7.6%
09/18/99	86.9	84.8	-2.4%	-2.6%	5.6%	5.8%
09/19/99	89.3	90.6	1.7%	1.3%	7.3%	7.2%
09/20/99	81.6	86.5	5.9%	5.5%	7.7%	7.4%

Used to assess 8-hour performance of the September 13-20, 1999 photochemical model in central Texas.



# Future Design Value

- 2002 design value for San Antonio is 89 (based on CAMS 23)
- 1999-2007 relative reduction factor is 0.953 for CAMS 23
- Calculated future design value with no additional control strategies is 84.83 => 84
- San Antonio EAC modeling demonstrates attainment without additional control strategies

# Emission Matrix Analysis

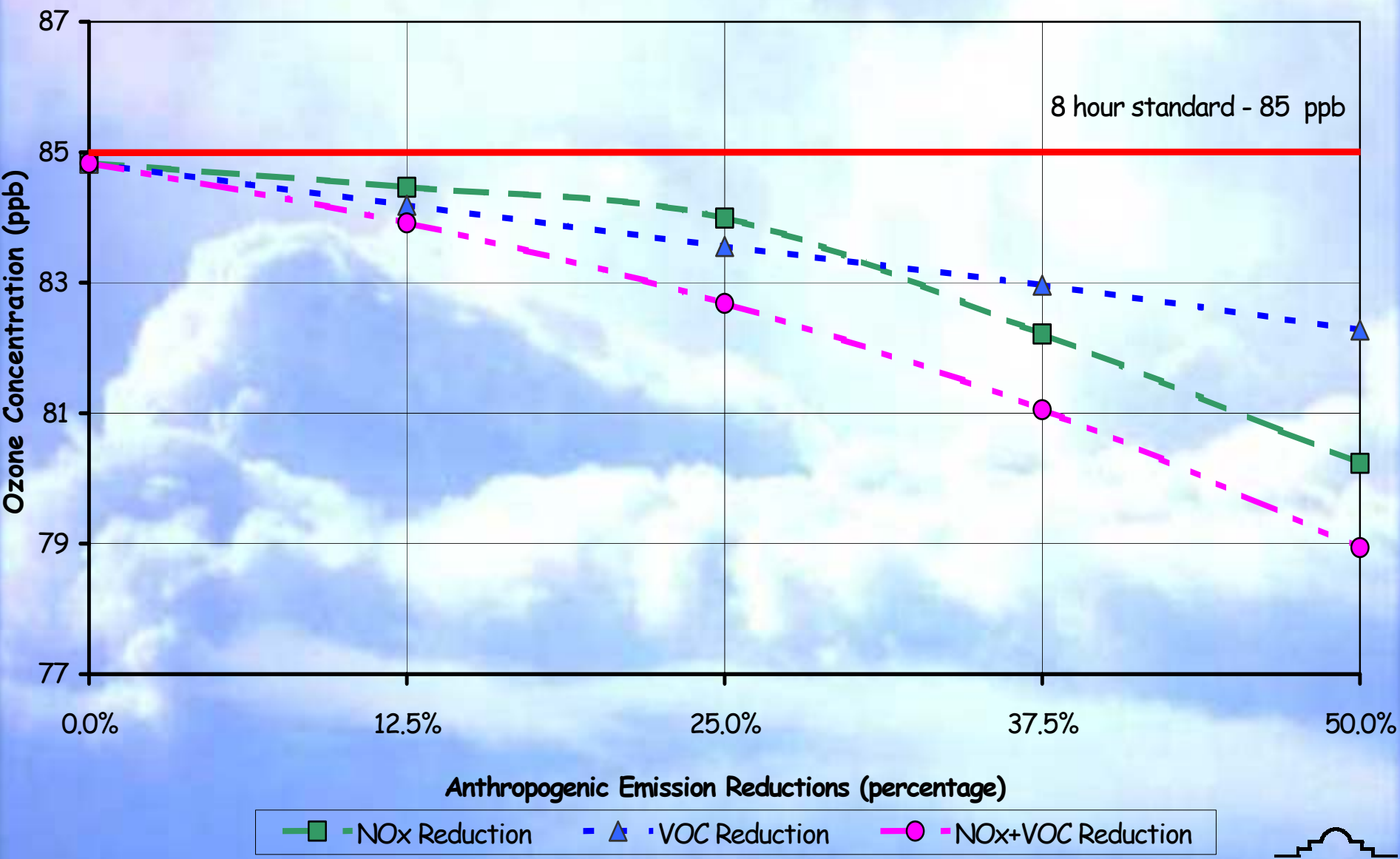
- Generalized Reduction Goals Required for Attainment:
  - ❖ Emission matrix analysis for 2007 modeling projection

## 20 ton Reduction Runs

- Generalized Effectiveness of Reductions According to Emission Source:
  - ❖ Reduce 20 tons of emissions from each source category (i.e., point sources) and by pollutant (VOC or NO<sub>x</sub>) in the emission inventory, and analyze the model results to determine the relative effectiveness by source category

# Emission Matrix Analysis: Average Reduction Comparison of NOx & VOC at CAMS 23 on Sept. 15-20, 2007

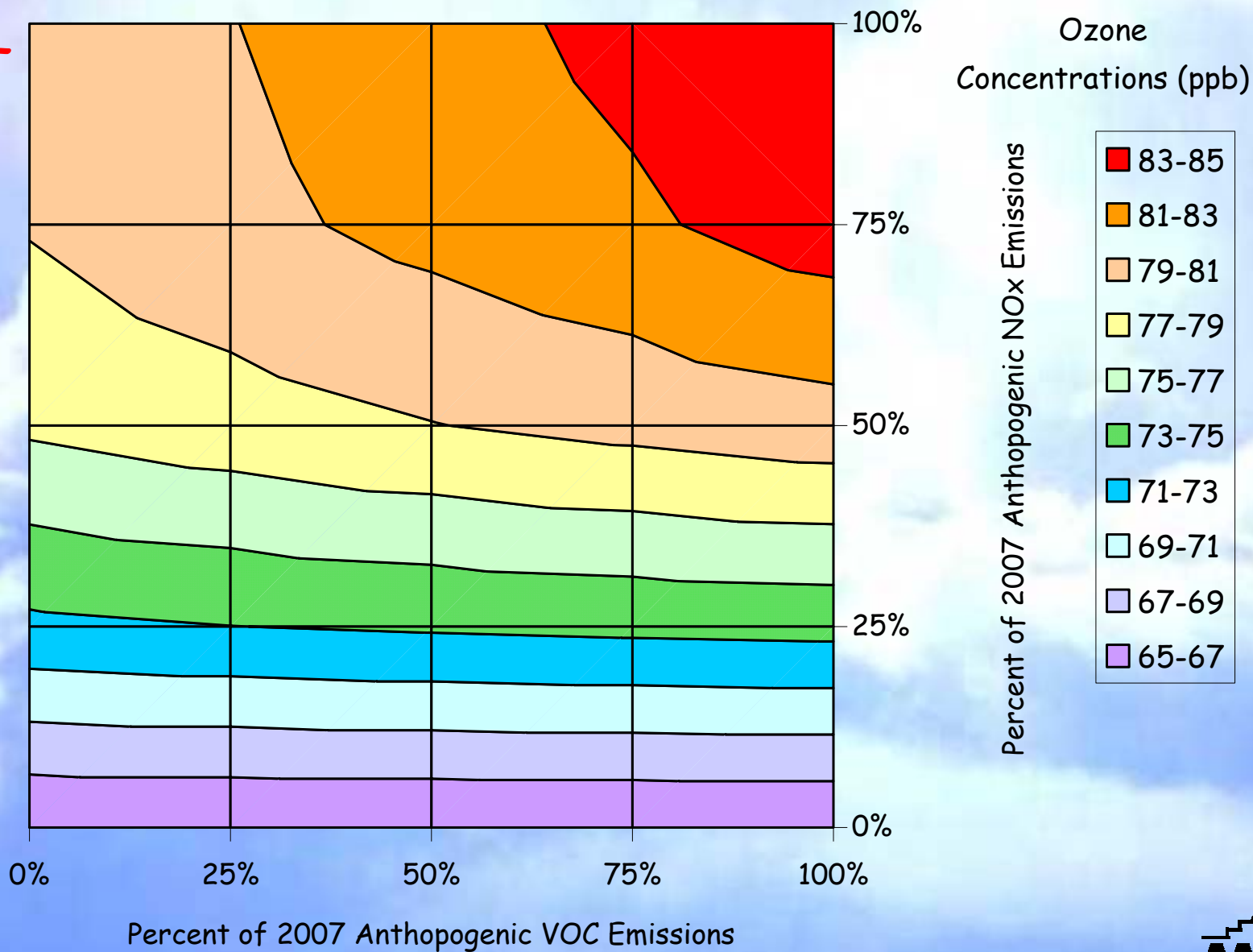
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Based on a Design Value of 84.83 - 8-hour average

# Emission Matrix Analysis: Average Reduction Comparison of NOx & VOC at CAMS 23 on Sept. 15-20, 2007

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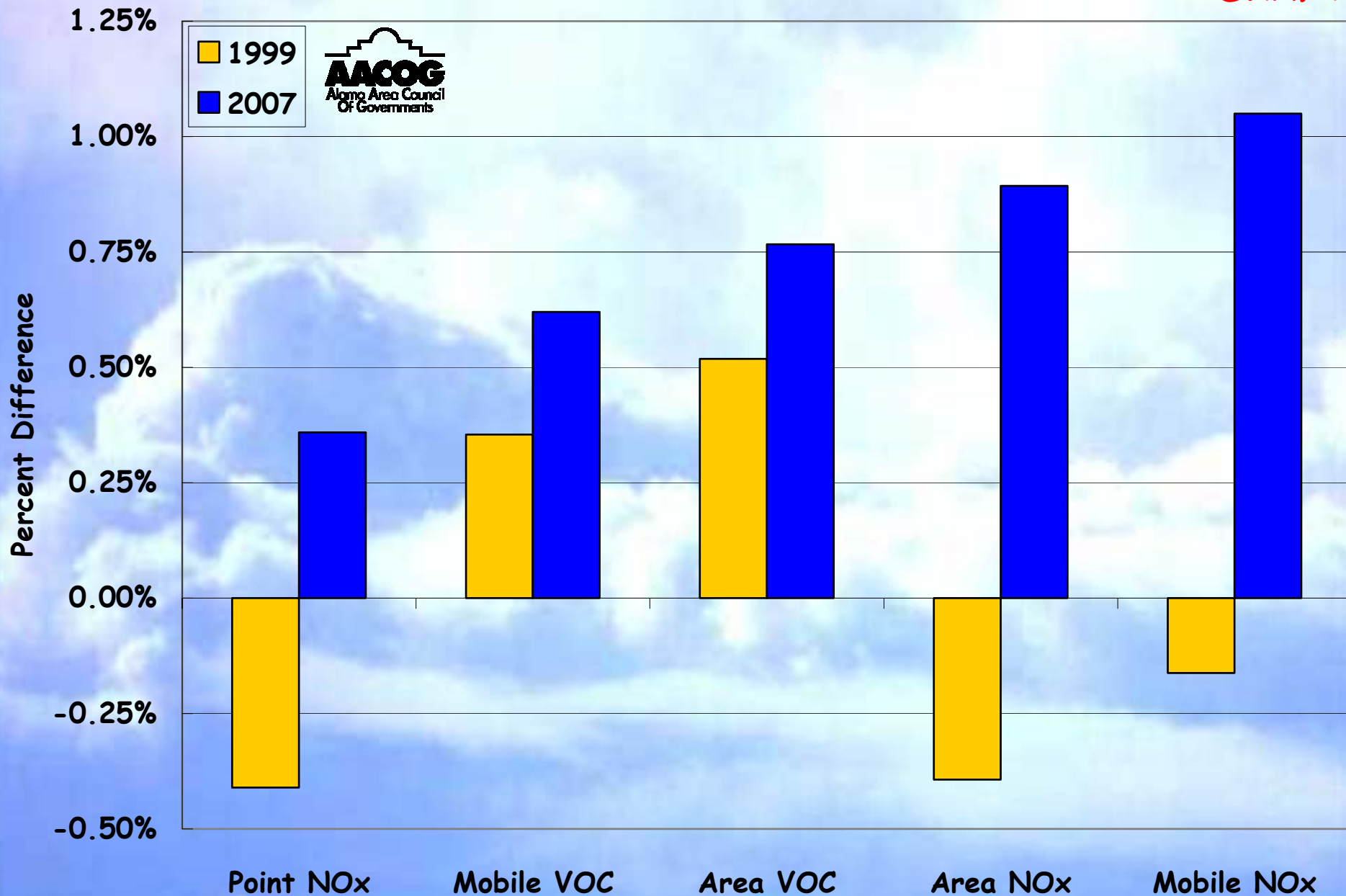
Based on a Design Value of 84.83 - 8-hour average





# Percent Difference between Base Case and 20 Ton Emission Precursor Reductions for 1999 and 2007 at CAMS 23

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# Pollution Transport

- Zero out San Antonio emissions (1999 & 2007)
- Zero out Houston emissions (1999 & 2007)
- Zero out Corpus Christi emissions (1999 & 2007)
- Zero out Austin emissions (1999 & 2007)
- Zero out selected counties in the San Antonio 4-county EAC area
- Zero out Toyota plant
- Zero out CPS coal-powered plants
- Reduce emissions from CPS Spruce 1 power plant (5.93 NOx tons/day)

# Ozone Reductions from "San Antonio Removed" Sensitivity Runs for Anthropogenic Sources at CAMS 23, Sept 15-20, 1999 & 2007

**San Antonio Removed  
(4-County Area) 2007**

Based on a Design  
Value of 84.83

22.16 parts per billion

**San Antonio Removed  
(4-County Area) 1999**

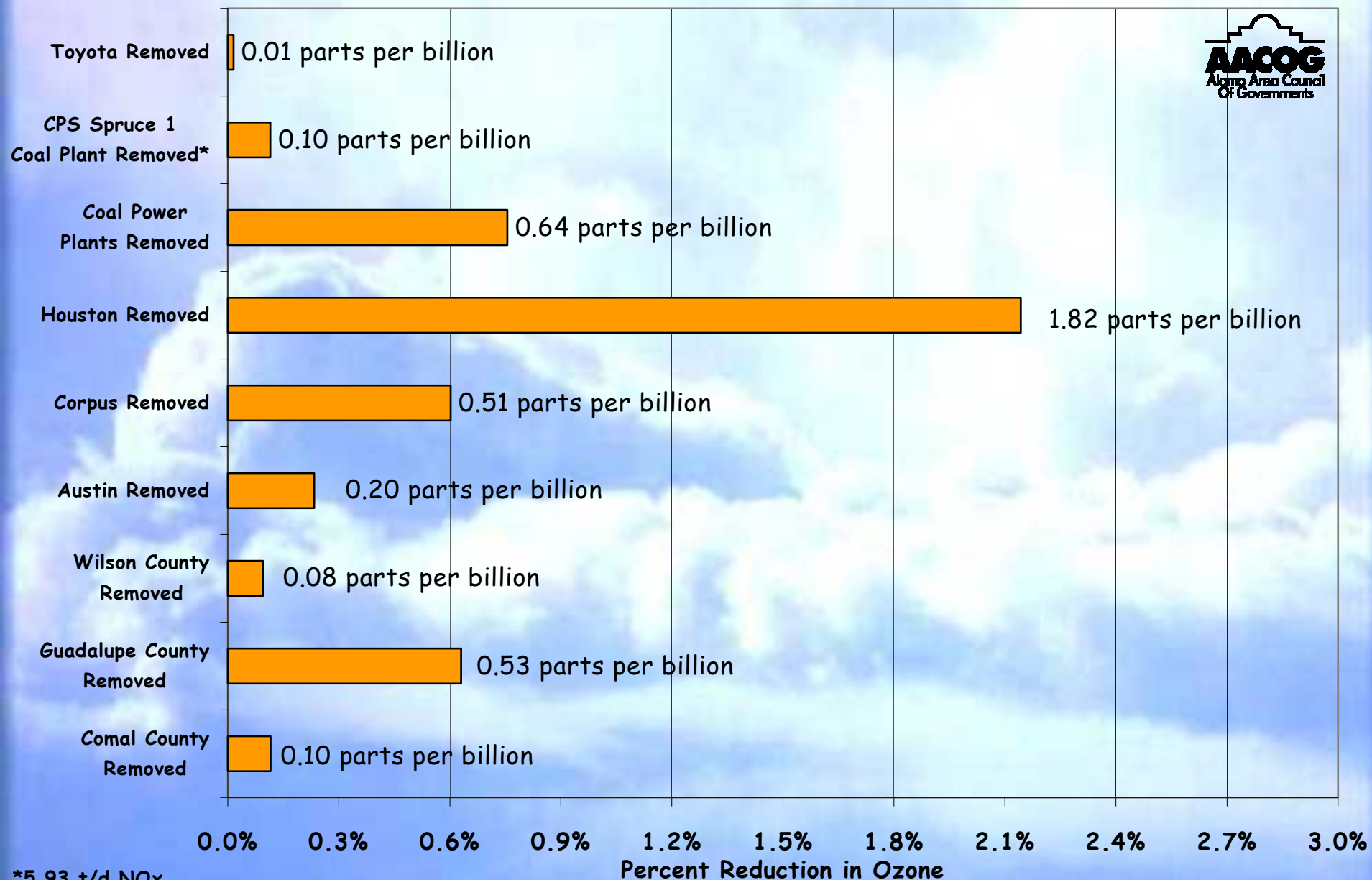
Based on a Design  
Value of 89.00

21.75 parts per billion

0.0% 5.0% 10.0% 15.0% 20.0% 25.0% 30.0%

Percent Reduction in Ozone

# Ozone Reductions from Anthropogenic Sources Sensitivity Runs at CAMS 23, Sept 15-20, 2007



\*5.93 t/d NO<sub>x</sub>

Based on a Design Value of 84.83

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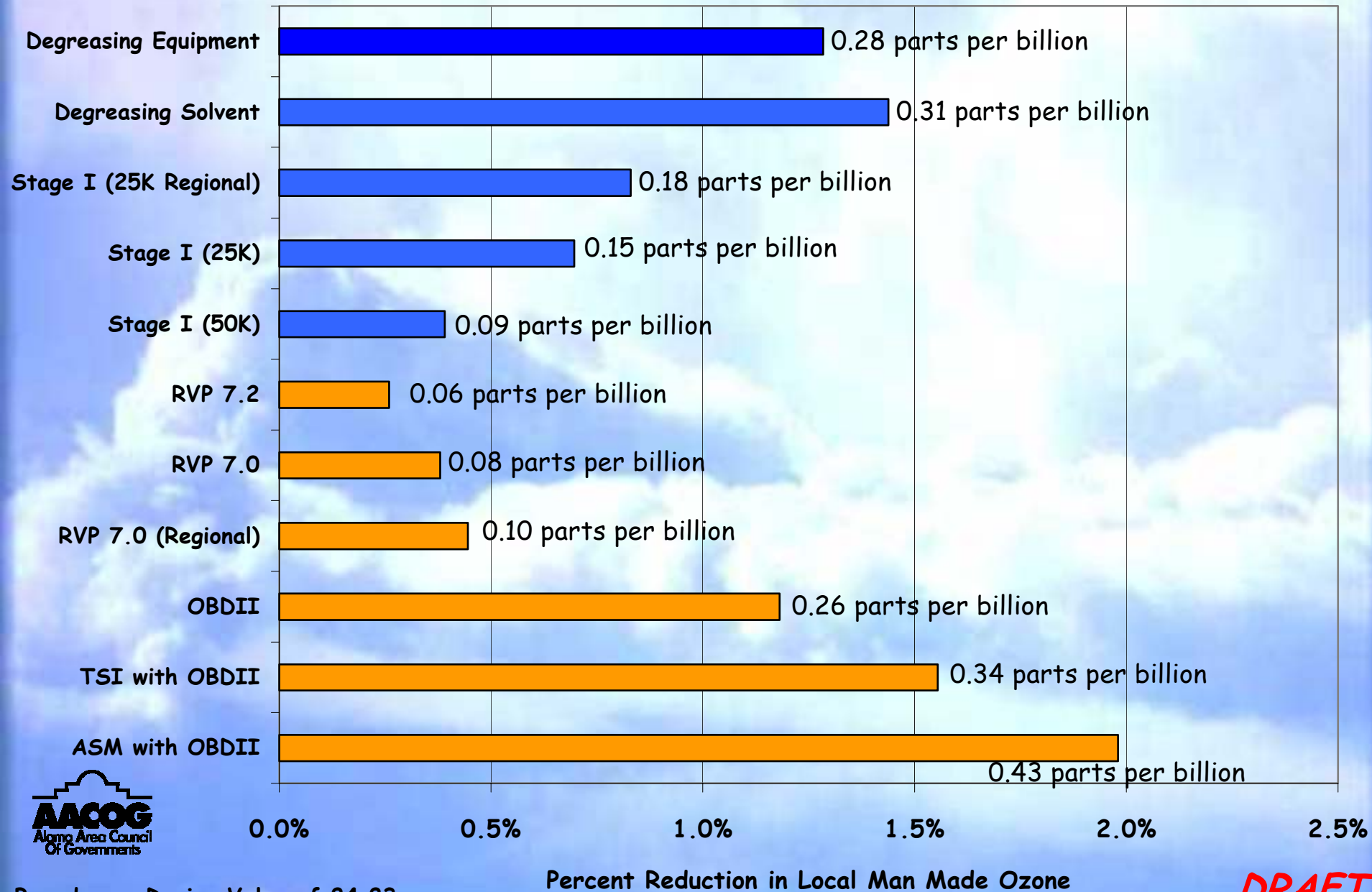
# Control Strategy Development

## ➤ Examined Control Strategies:

- Degreasing equipment and solvents
- Inspection and maintenance (OBDII, TSI, ASM)
- Wood furniture solvents and spray techniques
- Heavy Duty Diesel Vehicle (HDDV) idling
- Dry cleaning solvents
- Stage I vapor recovery
- Stage II vapor recovery
- Reduced gasoline sulfur
- Lower gasoline RVP
- TxLED diesel fuel
- Alternative fuels
- Transportation Demand Management (TDM) measures

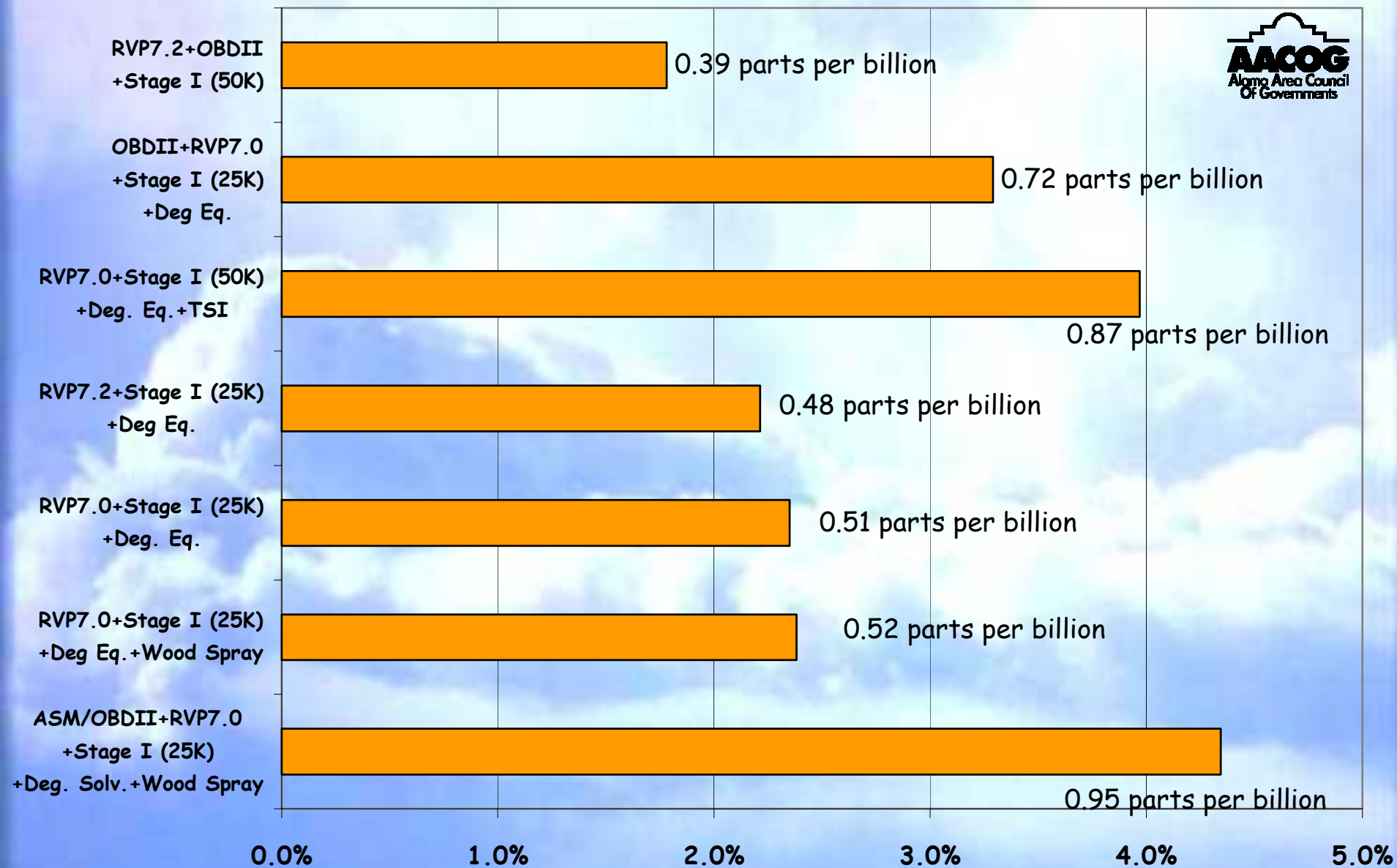
**Note:** Air Executive Committee will meet Jan. 28<sup>th</sup> to recommend control strategies to county and city officials.

# Anthropogenic Ozone Reductions from Examined Control Strategies at CAMS 23, Sept 15-20, 2007



# Modeled Ozone Reductions from Combined Anthropogenic Strategies at CAMS 23, Sept 15-20, 2007

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Percent Reduction in Local Man Made Ozone

\*Stage I; 50,000 gal/mo.

\*\*Stage I; 25,000 gal/mo.

Based on a Design Value of 84.83

## Next Steps:

- Continue work with affected industries and TCEQ to determine compliance abilities and limitations
- Determine requirements for further modeling
- Examine other control strategies (low emission gas cans and oil and gas compressor requirements)
- City Councils and County Commissioner Courts will vote on recommended control strategies in February or March
- Work with state and federal governments on pollution transport issues